APRIL/MAY 2025

23PPH33 — NUMERICAL METHODS AND COMPUTER PROGRAMMING – THEORY

Shanmuga Industries Arts & Science College
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Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What are the limitations of the Bisection method?

2. Given $f(x) = \sin(x) - 0.5$, perform one iteration of the Newton-Raphson method starting from $x_0 = 1$.

3. Find the inverse of the matrix : $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

4. Find the solution to the following system using the Gauss-Jordan method: $x + 2y = 5$, $3x + 4y = 6$.

5. What is the purpose of the least squares method in curve fitting?

6. What is Newton's forward interpolation formula used for interpolation?

7. Compare the accuracy of Gauss-Laguerre and Gauss-Chebyshev quadrature methods.

8. Write down the formula for the fourth-order Runge-Kutta formula for solving first-order ODEs.

9. Analyze the convergence of the Bisection method for the function $f(x) = x^2 - 2$ on the interval $[1, 2]$.

10. Analyze the output of a program that uses the Trapezoidal rule to approximate the integral of $f(x) = x^2$ over $[0, 1]$.

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SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) What are the conditions for the convergence of the Bisection method and the Newton-Raphson method?

Or

(b) Apply the Newton-Raphson method to find the root of $f(x) = x^2 - 4$ starting from $x_0 = 2$. And perform two iterations.